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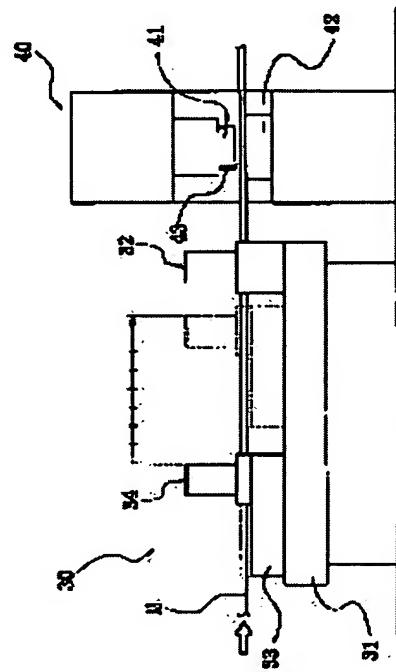
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(54) WORK TRANSPORTING DEVICE FOR SENDING WORK TO PRESS DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a work transporting device having a high feed precision, which sends a work to be a product while holding it by a gripper to a press device by which a product having a continuous prescribed shape with a fixed pitch is press formed with each pitch.

SOLUTION: A work transporting device 30, which is a device to send a plate stock M to be a product to a press device 40, is provided with a moving gripper 34, a linear motor and a control part. The plate stock M is gripped by the moving gripper 34. The moving gripper 34 is moved ≥ 800 mm which is a product length by the linear motor. The control part, in a state in which the plate stock M is gripped by the moving gripper 34, operates the linear motor to move the moving gripper 34 to the press device 40 with every pitch of 100 mm.



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EFFECT OF THE INVENTION

[Effect of the Invention] In this invention, since an at least two or more pitch migration gripper can be moved, if it becomes unnecessary to return a migration gripper to the original location for every 1 pitch **** and sends one pitch of work pieces at a time, compared with the conventional equipment which has returned the migration gripper to the original location, the count by which a misfeed difference is accumulated becomes fewer. Thereby, the delivery precision as a work piece being total improves.

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PRIOR ART

[Description of the Prior Art] When fabricating a product with which a predetermined configuration continues at fixed spacing (pitch) by press working of sheet metal, in order to attain the miniaturization of the mold used [which uses it and press-furnishes], a mold and a press facility are formed only in one predetermined configuration, and the method of sending out one pitch of work pieces at a time to press equipment may be adopted. For example, one product is intermittently fabricated for a band-like work piece by press working of sheet metal of delivery and multiple times to press equipment.

[0003] When fabricating the product which a predetermined configuration follows with the press of such multiple times, the work-piece transport device which can send out one pitch of work pieces at a time as equipment which sends out a work piece is used. As this kind of a work-piece transport device, the equipment of the type which sends out a work piece with a feed roll, and the equipment of the type which carries out rectangle movement of the gripper grasping a work piece exist.

[0004] Among these, in the case of the equipment which sends out a work piece using a feed roll, generating of slipping between a work piece and a roll is not avoided, but when a high delivery precision is searched for, it is hard to adopt this.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the work-piece transport device which sends a work piece to press equipment, and the work-piece transport device which sends out the work piece which serves as a product to the press equipment which carries out press forming of the product with which a predetermined configuration continues in a fixed pitch for every pitch especially.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the work-piece transport device which sends a work piece to press equipment, and the work-piece transport device which sends out the work piece which serves as a product to the press equipment which carries out press forming of the product with which a predetermined configuration continues in a fixed pitch for every pitch especially.

[0002]

[Description of the Prior Art] When fabricating a product with which a predetermined configuration continues at fixed spacing (pitch) by press working of sheet metal, in order to attain the miniaturization of the mold used [which uses it and press-furnishes], a mold and a press facility are formed only in one predetermined configuration, and the method of sending out one pitch of work pieces at a time to press equipment may be adopted. For example, one product is intermittently fabricated for a band-like work piece by press working of sheet metal of delivery and multiple times to press equipment.

[0003] When fabricating the product which a predetermined configuration follows with the press of such multiple times, the work-piece transport device which can send out one pitch of work pieces at a time as equipment which sends out a work piece is used. As this kind of a work-piece transport device, the equipment of the type which sends out a work piece with a feed roll, and the equipment of the type which carries out rectangle movement of the gripper grasping a work piece exist.

[0004] Among these, in the case of the equipment which sends out a work piece using a feed roll, generating of slipping between a work piece and a roll is not avoided, but when a high delivery precision is searched for, it is hard to adopt this.

[0005]

[Problem(s) to be Solved by the Invention] On the other hand, with the equipment using a gripper, the gripper grasping a work piece is advanced by one pitch according to migration devices, such as a pneumatic cylinder, and after making a work piece detach there, actuation of returning a gripper to the original location is repeated. In the case of this approach, in order to hold a work piece firmly with a gripper, while holding the work piece, neither slipping nor gap is generated.

[0006] However, since a grip substitute of the work piece by the gripper is performed for every 1 pitch **** and the same actuation is repeated, even if the precision in 1 pitch **** actuation is high, it is difficult by repeating actuation two or more times to accumulate a misfeed difference and to secure the dimensional accuracy of a final product. For example, when piercing an eight-set notch to a band-like member by eight press working of sheet metal, fabricating and the delivery die length in each actuation is insufficient 0.1mm, although the notch fabricated in the way of the beginning enters within the limits of a dimensional tolerance, the notch fabricated in the way of the last will become the dimension error of about 1mm, and will separate from it from the range of a dimensional tolerance.

[0007] The technical problem of this invention is a work-piece transport device sent out while holding with a gripper the work piece which serves as a product to the press equipment which carries out press forming of the product with which a predetermined configuration continues for said every pitch in a fixed pitch, and is to offer equipment with a high precision of a send.

[0008]

[Means for Solving the Problem] A work-piece transport device according to claim 1 is equipment which sends out the work piece which serves as a product to press equipment, and is equipped with the migration gripper, the migration device, and the control section. Press equipment carries out press forming of the product with which a predetermined configuration continues in a fixed pitch for every pitch. A migration gripper can hold a work piece. A migration device can move at least two or more pitches of migration grippers. A control section is in the condition of having made the work piece holding, operates a migration device to a migration gripper, and makes it move one pitch of migration

grippers at a time to press equipment.

[0009] With the equipment of this claim, the work piece is sent out to press equipment by holding a work piece with a migration gripper and moving one pitch of migration grippers at a time by the migration device. And since a migration device can move an at least two or more pitch migration gripper here, it is not necessary to return a migration gripper to the original location for every 1 pitch ****, and at least 2 pitches can be moved to press equipment, without returning a migration gripper. Therefore, if it sends one pitch of work pieces at a time, compared with the conventional equipment which has returned the migration gripper to the original location, the count by which a misfeed difference is accumulated becomes fewer. For this reason, with this equipment, it becomes easy to secure the dimensional accuracy of a final product.

[0010] A work-piece transport device according to claim 2 is equipment according to claim 1, and whenever a control section moves one pitch of migration grippers to press equipment, it makes press forming of a work piece perform to press equipment. Here, if one pitch of migration grippers is moved and a work piece is sent into press equipment by one pitch, press equipment will perform press forming to a work piece. That is, press forming of the 1 pitch ***** is carried out for a work piece by one pitch. Therefore, press equipment should just be equipped with the mold and press facility corresponding to the predetermined configuration for one pitch.

[0011] A work-piece transport device according to claim 3 is equipment according to claim 1 or 2, and a migration device can move [die length / of a product] a migration gripper at least. Since a migration gripper can be moved by the die length of a product, here, moving a control section to press equipment, without making a migration gripper retrace one's steps can be continued until all the parts of a product are fabricated by press working of sheet metal of multiple times. That is, a migration gripper can send out a work piece to press equipment, continuing holding a work piece until a product is fabricated completely. For this reason, while it is lost that a migration gripper rechanges the maintenance location of a work piece, repeat actuation of rectangle movement of a migration gripper like before is lost, and aggravation of the dimensional accuracy of the product resulting from accumulation of a misfeed difference can be avoided.

[0012] A work-piece transport device according to claim 4 is equipment according to claim 3, and after a control section moves only the number with which one pitch of predetermined configurations of a product continues a migration gripper at a time, it makes maintenance of the work piece by the migration gripper cancel, and returns a migration gripper to the original location. Here, after only the number with which one pitch of predetermined configurations of a product continues at a time moved the migration gripper (i.e., after only the number of pitches required to send out one-pitch [every] one product sends out a work piece), maintenance of the work piece of a migration gripper was canceled and the migration gripper is returned to the original location. The preparation which sends out the work piece used as the following product to press equipment by this is completed. In other words, although it is intermittent, without maintenance of the work piece by the migration gripper continuing, and returning a migration gripper until it sends out the work piece for one product here, a work piece is continuously sent out to press equipment.

[0013] A work-piece transport device according to claim 5 is equipment according to claim 4, and is further equipped with the fixed gripper. To press equipment, a fixed gripper cannot be displaced relatively and can hold a work piece. Moreover, a control section returns a migration gripper to the original location in the condition of having made the work piece holding to a fixed gripper, and having made maintenance of the work piece by the migration gripper canceling, after moving only the number with which one pitch of predetermined configurations of a product continues a migration gripper at a time.

[0014] Here, when sending out a work piece, a work piece is held with a migration gripper, and when returning a migration gripper to the original location, the work piece is held with the fixed gripper so that a work piece may not shift. A work-piece transport device according to claim 6 is equipment given in either of claims 1-5, and the migration device has the linear motor to which rectilinear motion of the migration gripper is carried out.

[0015] Here, in order to move a migration gripper using a linear motor, rapidity is secured compared with the case where delivery precision improves compared with the case where pneumatic pressure and oil pressure are used, and an electric ball screw device is used.

[0016]

[Embodiment of the Invention] The work-piece transport device 30 and the press equipment 40 which are 1 operation gestalt of this invention are shown in drawing 1. These equipments 30 and 40 are equipment designed in order to make the thing used as the intermediate product of the driven plate 20 of the lock-up clutch 2 in the torque converter shown in drawing 3. Below, the explanation about the intermediate product P made by these equipments 30 and 40 is described first.

[0017] The intermediate product P of the driven plate 20 fabricated by <intermediate product P> drawing 2 with the above-mentioned work-piece transport device 30 and press equipment 40 is shown. This intermediate product P is an intermediate product of the driven plate 20 of the lock-up clutch 2 contained in a torque converter, and after it performs

rolling and both-ends *****, the annular driven plate 20 with a cross-section configuration like drawing 3 is made to it by performing bending. Shifting a location, press working of sheet metal of multiple times is performed to the band-like plate material M (refer to drawing 1), and this intermediate product P is fabricated so that it may mention later. Moreover, an overall length is 800mm and the intermediate product P has become what the eight same predetermined configurations with a die length of 100mm followed.

[0018] In addition, drawing 3 is the outline sectional view of a torque converter 1, an engine (not shown) is arranged on the left-hand side of drawing, and transmission (not shown) is arranged on the right-hand side of drawing. A torque converter 1 is a device for transmitting torque to the Maine drive shaft of transmission from the crankshaft by the side of an engine, and mainly consists of the front cover 3 connected with the crankshaft by the side of an engine through a flexible plate, the impeller 4, a turbine 5 connected with the Maine drive shaft of transmission, a stator 6, and a lock-up clutch 2. The lock-up clutch 2 is arranged between the front cover 3 and the turbine 5 in shaft orientations. The lock-up clutch 2 mainly consists of the piston 17, a retaining plate 19, a driven plate 20, and a torsion spring 21. The driven plate 20 is a ring-like member, fixed part 20b is fixed to the engine side of a turbine 5, and two or more bending pawl 20a stops it to the circumferencial direction both ends of the torsion spring 21.

[0019] the plate material M whose <work-piece transport-device> work-piece transport device 30 is a work piece -- press equipment 40 -- one pitch 100mm -- every -- it is equipment to send out and mainly consists of standing ways 31, a fixed gripper 32 currently fixed ahead of standing ways 31 (method of the right of drawing 1), and a migration gripper 34 fixed to the slider 33 movable forward and backward and a slider 33 in a standing-ways 31 top.

[0020] A slider 33 moves forward and backward (right and left of drawing 1) in a standing-ways 31 top by linear motor 33a (refer to drawing 4) included in a slider 33 and standing ways 31. Linear motor 33a is a thrust generator which develops linearly the stator (primary conductor) of a rotation form motor, and Rota (secondary conductor), and transforms electromagnetic force into directly linear mechanical energy, the primary conductor is built into standing ways 31, and the secondary conductor is built into the slider 33. In addition, it enables it to move a standing-ways 31 top only to a distance a little with a slider 33 longer than 800mm which is the die length of an intermediate product P.

[0021] The fixed gripper 32 has a back face supporting the inferior surface of tongue of the plate material M conveyed, and air cylinder 32a (refer to drawing 4), and is being fixed to standing ways 31 by relative-displacement impossible. It is equipped with the attachment component which presses down the plate material M to a back face at the tip of a rod of air cylinder 32a, and the condition of having made the attachment component deserting the condition of having gripped the plate material M by the attachment component and the back face, and the plate material M, and having canceled the grip of the plate material M can be changed by making the rod of air cylinder 32a go up and down. The change of this condition is performed by the control section 60 which controls supply of the high-pressure air to air cylinder 32a.

[0022] The migration gripper 34 has a back face supporting the inferior surface of tongue of the plate material M conveyed, and air cylinder 34a (refer to drawing 4), and is being fixed to the slider 33 by relative-displacement impossible. It is equipped with the attachment component which presses down the plate material M to a back face at the tip of a rod of air cylinder 34a, and the condition of having made the attachment component deserting the condition of having gripped the plate material M by the attachment component and the back face, and the plate material M, and having canceled the grip of the plate material M can be changed by making the rod of air cylinder 34a go up and down. The change of this condition is performed by the control section 60 which controls supply of the high-pressure air to air cylinder 34a.

[0023] Moreover, the position transducer 35 (refer to drawing 4) which detects the relative position of standing ways 31 and a slider 33 is formed in the work-piece transport device 30, and the detection result is used for the feedback control of linear motor 33a by the control section 60.

<Press equipment> press equipment 40 is equipment which cuts and lacks the plate material M in a predetermined configuration by one pitch with a punch 41 and female mold 42. The flat-surface configuration of the intermediate product P shown in drawing 2 is a configuration where eight predetermined configurations for one pitch continued. Press working of sheet metal (notching processing) is performed to that this press equipment 40 is electric or the plate material M which is depressing a punch 41 to the female mold 42 of immobilization by punch drive 40a (referring to drawing 4) of a hydraulic drive, and is sent at a time one pitch from the work-piece transport device 30.

[0024] In addition, press equipment 40 is further equipped with the cutter 43 which adjoins a punch 41, and oil hydraulic cylinder 43a for cutters (refer to drawing 4) which carries out vertical migration of the cutter 43. This cutter 43 cuts the back end of the plate material M used as an intermediate product P, after performing eight press working of sheet metal to the plate material M.

The control-block Fig. of the work-piece transport device 30 and press equipment 40 is shown in <actuation of work-piece transport-device and press equipment> drawing 4 . These equipments 30 and 40 are controlled by the control section 60 which consists of a microcomputer, memory, etc. A control section 60 reads the information from the input unit 70 for inputting setups, such as the die length of one pitch of the predetermined configuration which an

intermediate product P follows, and a continuous number, and receives the detection result from a position transducer 35, plans timing, and controls each actuator machine.

[0025] First, if a part for the point of the plate material M is conveyed between the vertical mold 41 of press equipment 40, and 42, press working of sheet metal will be performed to the 1st time by press equipment 40. This 1st press working of sheet metal is performed about a part for one pitch of the plate material M, as shown in drawing 2. In addition, the location of the slider 33 at the time of the 1st press working of sheet metal turns into a location which progressed ahead only part 100mm for one pitch from the location shown as the continuous line of drawing 1. That is, before sending the plate material M by one pitch for the 1st press working of sheet metal, a slider 33 is arranged in the location shown as the continuous line of drawing 1.

[0026] Next, linear motor 33a is operated as a condition which gripped the plate material M with the migration gripper 34, and a slider 33 is ahead moved by one pitch (i.e., 100mm). At this time, the fixed gripper 32 is in the condition of not gripping the plate material M. Thereby, the plate material M is ahead sent by one pitch, and the part just behind the part fabricated by the 1st press working of sheet metal is conveyed between the vertical mold 41 of press equipment 40, and 42. Press equipment 40 is ordered [control section / 60] about a part for one pitch of the plate material M in delivery and the 2nd press working of sheet metal here.

[0027] Then, conveyance of part 100mm for one pitch of the slider 33 by actuation of the above-mentioned linear motor 33a and the plate material M and press working of sheet metal are repeated 6 times. Gripping this middle plate material M is continued in the migration gripper 34. And when the last press working of sheet metal [8th] is performed, a slider 33 and the migration gripper 34 come to the location shown by the dotted line of drawing 1. After the 8th press working of sheet metal finishes, the back end of the part which moved oil hydraulic cylinder 43a for cutters, and performed 8th press working of sheet metal by the cutter 43 is cut.

[0028] Press forming of the intermediate product P shown in drawing 2 is carried out by cutting by such eight press working of sheet metal and a cutter 43 while shifting one pitch of locations at a time. After cutting by the cutter 43 finishes, in order to perform press working of sheet metal to the continuing plate material M, a control section 60 operates linear motor 33a, and returns a slider 33 and the migration gripper 34 to the original location (location shown as the continuous line of drawing 1). It is made for the location of the plate material M not to shift by making the plate material M grip with the fixed gripper 32, and making the grip of the plate material M by the migration gripper 34 cancel at this time.

[0029] And when beginning to perform a series of following eight press working of sheet metal, the grip of the plate material M by the fixed gripper 32 is made to cancel, and the plate material M is made to grip with the migration gripper 34 again.

The grip of the plate material M by the migration gripper 34 is made to be maintained until it takes the migration stroke of a slider 33 and the migration gripper 34 longer than die length of 800mm of the pars intermedia material P, eight press working of sheet metal is completed and all the parts of an intermediate product P are fabricated with the equipment of a <description of equipment> (1) book operation gestalt. therefore, one pitch 100mm -- every -- if the plate material M is sent, the fault generated in the conventional equipment which has returned the migration gripper to the original location, i.e., the fault that a misfeed difference is accumulated, is canceled. For this reason, the dimensional accuracy of the final intermediate product P improves.

[0030] In addition, in the work-piece transport device 30 of this operation gestalt, the error at the time of sending 1 pitch 100mm is suppressed by 0.1mm or less, and the delivery precision as the whole intermediate product P for eight pitches is also secured by feedback control.

(2) With the equipment of this operation gestalt, in order that the work-piece transport device 30 may send one pitch of plate materials M at a time into press equipment 40 with a sufficient precision, press equipment 40 has become that what is necessary is just to have the vertical molds 41 and 42 and punch drive 40a corresponding to the predetermined configuration for one pitch. That is, it is not necessary to have the big vertical mold and big drive corresponding to a configuration for eight pitches, and the cost of press equipment 40 is held down small.

[0031] (3) With the equipment of this operation gestalt, since the slider 33 and the migration gripper 34 are moved using linear motor 33a, compared with the case where pneumatic pressure and oil pressure are used, delivery precision is good, and rapidity is secured compared with the case where a device which combines a servo motor with an electric ball screw is used.

[0032]

[Effect of the Invention] In this invention, since an at least two or more pitch migration gripper can be moved, if it becomes unnecessary to return a migration gripper to the original location for every 1 pitch **** and sends one pitch of work pieces at a time, compared with the conventional equipment which has returned the migration gripper to the original location, the count by which a misfeed difference is accumulated becomes fewer. Thereby, the delivery precision as a work piece being total improves.

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CLAIMS

[Claim(s)]

[Claim 1] The work-piece transport device which is characterized by providing the following and which sends out the work piece which serves as a product to the press equipment which carries out press forming of the product with which a predetermined configuration continues for said every pitch in a fixed pitch. The migration gripper which can hold a work piece. The migration device to which at least two or more pitches of said migration gripper can be moved, and the control section which operates said migration device to said migration gripper, and makes it move one pitch of said migration grippers at a time to said press equipment in the condition of having made the work piece holding

[Claim 2] Said control section is a work-piece transport device according to claim 1 which makes press forming of a work piece perform to said press equipment whenever it moves one pitch of said migration gripper to said press equipment.

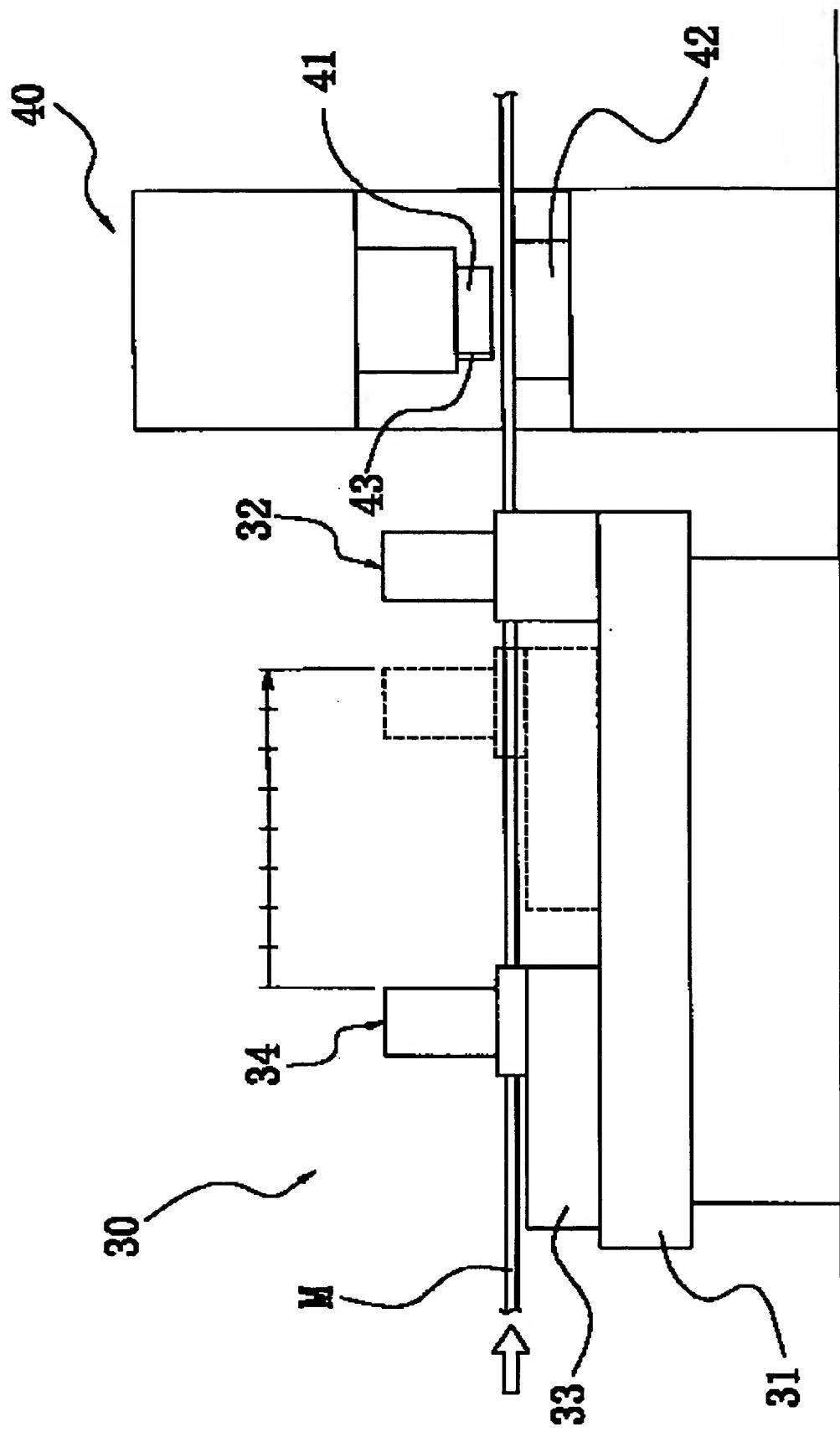
[Claim 3] Said migration device is the work-piece transport device according to claim 1 or 2 to which only the die length of said product can move said migration gripper at least.

[Claim 4] Said control section is a work-piece transport device according to claim 3 which is made to cancel maintenance of the work piece by said migration gripper, and returns said migration gripper to the original location after only the number with which one pitch of predetermined configurations of said product continues at a time moves said migration gripper.

[Claim 5] It is the work-piece transport device according to claim 4 which returns said migration gripper to the original location in the condition made the work piece hold to said fixed gripper, and made maintenance of the work piece by said migration gripper cancel, by being able to hold a work piece and having further the fixed gripper which cannot be displaced relatively to said press equipment after said control section moves only the number with which one pitch of predetermined configurations of said product continues said migration gripper at a time.

[Claim 6] Said migration device is a work-piece transport device given in either of claims 1-5 which has the linear motor to which rectilinear motion of said migration gripper is carried out.

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